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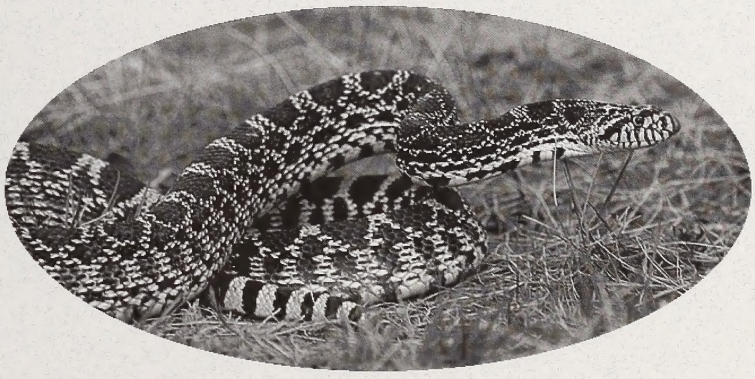
WILDLIFE CONSERVATION AND BIODIVERSITY SECTION

# Bullsnakes *(Pituophis catenifer sayi)* in Alberta: Literature Review and Data Compilation



**Alberta Species at Risk Report No. 62**

Alberta
SUSTAINABLE RESOURCE DEVELOPMENT

# Bullsnakes (*Pituophis catenifer sayi*) in Alberta: Literature Review and Data Compilation

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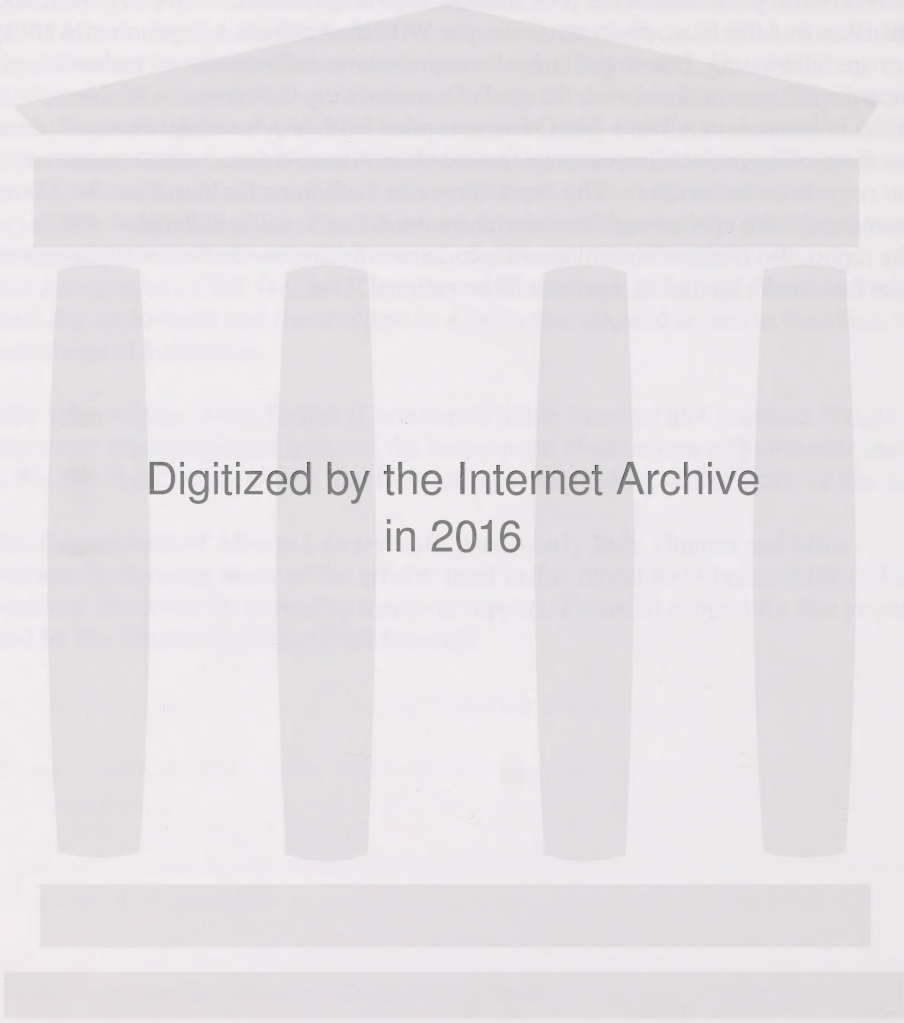
## Executive Summary

The bullsnake (*Pituophis catenifer sayi*) has been identified as a 'sensitive' species in Alberta due to concerns that it may be in danger of decline. Additionally, COSEWIC has recently assigned a designation of 'data deficient' to the bullsnake, due to a lack of information on this species' population size and trends within Canada. Bullsnakes are classified as a 'non-license' species and receive no protection under provincial or federal legislation. However, hibernation sites of bullsnakes in Alberta are protected under the Wildlife Act from 1 September to 30 April when snakes are hibernating. Due to the lack of comprehensive information on bullsnake populations, a project was initiated with the goal of summarising the current available information on bullsnakes in Alberta. Data were compiled from provincial databases, museum records, den monitoring projects, researchers, casual observation, enforcement occurrence records, and records in the literature. This report provides background information for future status assessments of this species and for researchers intending to study bullsnakes within Alberta. The report also outlines several recommendations for future research and management of bullsnakes that can be applied at a provincial or national level.



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## INTRODUCTION

In Canada, the bullsnake (*Pituophis catenifer sayi*) occurs only in southern Alberta and Saskatchewan (Figure 1). Bullsnakes are the second largest snake species in Canada (after the black rat snake (*Elaphe obsoleta*) in Ontario) and can reach over 2 metres in length. Bullsnakes can be identified by their size and by their yellowish colour with dark blotches on their dorsal side. In Canada, bullsnakes are commonly misidentified as prairie rattlesnakes (*Crotalus viridis*) due to their similarity in colour, pattern, and habitat use.

In Alberta, the bullsnake is designated as a 'sensitive' species due to concerns that it may be at risk of decline in the province (General Status of Wild Species in Alberta, 2000). Anecdotal reports, primarily by landowners and leaseholders, suggest that bullsnakes have declined in recent years (Cottonwood Consultants 1986, 1987, Hofman 1991). In Saskatchewan, bullsnakes are ranked as S4 indicating that they are widespread and locally abundant, but may be of long-term conservation concern (Conservation Data Centre, 2002). Bullsnakes are classified as a 'non-license' species and receive no protection under provincial or federal legislation. However, hibernation sites of all snakes in Alberta are protected under the Wildlife Act from 1 September to 30 April when snakes are hibernating. No comprehensive study of bullsnake population sizes and trends has been conducted within Alberta or Saskatchewan. This lack of detailed information on bullsnakes in Canada was highlighted in a recent status report presented to the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (Waye and Shewchuk 1999), and subsequently led to bullsnakes being designated as 'data deficient' by COSEWIC.

The purpose of this report is to summarise the current available information on bullsnakes in Alberta as background for future status assessments of this species and for researchers intending to study bullsnakes within Alberta. This report also outlines several recommendations for future research and management of bullsnakes that can be applied at a provincial or national level.

## STUDY AREA

Historically, bullsnakes have been located in Alberta near Trochu south to the Canada-United States border and east of Calgary to the Alberta-Saskatchewan border (Cottonwood Consultants 1986, Russell and Bauer 2000). This project compiles information throughout the range of the bullsnake in Alberta.

## METHODS

### Literature search

A search for literature (e.g., reports, books, and journal articles) with information on bullsnakes was conducted using the worldwide web, the NEOS consortium library that allows access to the University of Alberta Librairies and other academic and government libraries, and using the Wildlife and Ecology Studies Worldwide database (accessed via Biblioline version 8.24, NISC International Inc., Baltimore, Maryland). Searches were conducted using the keywords "*Pituophis*", "bullsnake", and/or "bull snake". Literature referenced within documents that were found using these databases provided additional sources of information on bullsnakes.

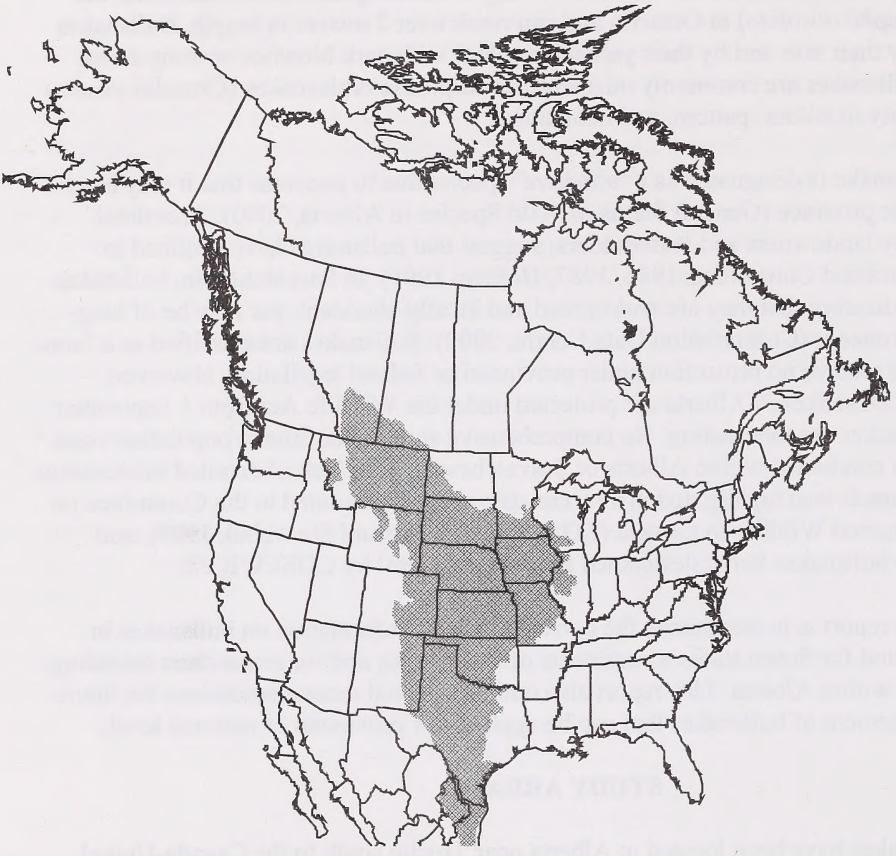

Figure 1. The range of the bullsnake (*Pituophis catenifer sayi*) within North America (modified from Conant and Collins 1991).

**Data compilation**

Records of bullsnakes observed in Alberta were acquired in several ways. First, the Alberta Biodiversity/Species Observation Database (BSOD) was queried for records of bullsnakes. Second, a letter (Appendix 1) was mailed to a number of individuals and organizations requesting records of bullsnakes from Alberta. These individuals included Government of Alberta biologists and conservation officers, Government of Canada biologists, Alberta Conservation Association biologists, curators from the Provincial Museum of Alberta, University of Alberta Zoology Museum, Royal Saskatchewan Museum, and the Canadian Museum of Nature, biologists at private consulting companies, and naturalists expected to have data on bullsnakes. Third, records of bullsnakes were taken from the literature. Finally, individuals known to have behavioural observations of bullsnakes were contacted directly for their information.

## RESULTS

### Taxonomy of the Species and Subspecies

*Pituophis catenifer* is in the family Colubridae and is represented by two subspecies in Canada: the bullsnake (*P.c. sayi*) in southern Alberta and Saskatchewan and the great basin gopher snake (*P.c. deserticola*) in southern British Columbia. The pacific gopher snake (*P. c. catenifer*) once occurred in British Columbia but is now extirpated (COSEWIC). Formerly, *Pituophis catenifer* was recognized as *Pituophis melanoleucus*. Within North America, taxonomists have now designated western and central populations of *Pituophis* as *catenifer* and eastern populations as *melanoleucus* (Crother et al. 2000). Bullsnakes have morphological characteristics intermediate between *catenifer* and *melanoleucus* (Waye and Shewchuk 1999). Further taxonomic study may return *P. catenifer sayi* to *melanoleucus* or assign it to a separate species (Crother et al. 2000).

### Description

Bullsnakes generally can be identified by their large size and by their yellowish colour with black, brown, or reddish-brown blotches on their dorsal and lateral sides. Considerable variation in colour may exist among individuals. In particular, juveniles often have lighter blotches than adults (K. Kissner, pers. observ.). Colour also may vary geographically. In the Drumheller area of Alberta individuals tend to be paler in colour than individuals from other areas of the province (J. Wright, unpubl. data). Ventral scales are generally yellow with some brown checkering. Other distinguishing features include a head that is as wide as the neck, a dark stripe that stretches across the eyes to the upper jaw and round pupils, in contrast to the vertical pupils of rattlesnakes (Waye and Shewchuk 1999, Russell and Bauer 2000).

Bullsnakes are the largest species of snake in Alberta. Adults typically range in size from 900 to 2000 mm (Russell and Bauer 2000). One record from East Coulee, Alberta describes a male measuring 2045 mm in total length (J. Wright, unpubl. data). As adults, males are generally larger than females (Russell and Bauer 2000).

**Distribution in Alberta**

The map in Figure 2 provides locations (township, range) of bullsnakes in Alberta that were compiled from various sources. Records from the Trochu area represent the northernmost limits of this species range in North America. Unconfirmed reports as far west as Brocket along the Old Man drainage extend the southwestern limit of this species' range in Alberta (J. Wright, pers. comm.).

**Habitat**

Bullsnakes are commonly found in short and mixed grass prairie. Within prairie habitat, bullsnakes are common in brushy and sandy areas and around badlands and rocky outcrops along major river valleys. Bullsnakes also may be found in farmland and fields, either because agricultural fields intersect prairie habitat or because small mammal prey may be abundant in these fields. Bullsnakes are adept climbers and are regularly observed in trees along river valleys, probably in search of birds, eggs, and nestlings.

In Alberta, bullsnakes occur within the Grassland Natural Region, primarily in the dry mixed grass and mixed grass subregions. Warm summers and cold winters, with little precipitation, characterize these areas. At Canadian Forces Base (CFB) Suffield, Didiuk (1999) constructed drift fences and traps across 11 habitat types dominated by trees, shrubs or grasses in order to investigate habitat use by several snake species. Although, bullsnakes were captured in all 11 habitats, they were predominantly found in grass terrace and grass moraine habitats. A disproportionate number of snakes were also captured near old buildings and at the interface of cottonwood (*Populus deltoides*) and sagebrush (*Artemesia cana*) where cover and foraging habitat would be optimal. One account suggests that two bullsnakes may have mated in a cottonwood tree near Drumheller (Bullock 1981).

Bullsnakes spend the winter months in hibernation and must locate appropriate over-wintering sites that protect them from freezing temperatures. Suitable sites for hibernacula include stable slump blocks, meander scarps and fissures, sinkholes, rocky outcrops, and mammal burrows (Cottonwood Consultants 1987, Shewchuk 1997, Didiuk 1999). In Alberta, these features tend to be associated with major river valleys and most hibernation sites are located along the breaks and coulees of the South Saskatchewan, Red Deer, Bow, Oldman and Milk Rivers. Didiuk (1999) reported that eight of 11 den sites found within CFB Suffield were mammal burrows of coyotes or badgers, and suggested that burrowing mammals provide access to underground cracks and crevices suitable for hibernation. Natural hibernacula tend to be located on south, east, or southeast facing slopes because these aspects provide maximum solar insolation and protection from prevailing winds (Didiuk 1999, A. Fast, unpubl. data). An unconfirmed report of bullsnakes hibernating underneath a pumping station along the Red Deer River south of Hanna, suggests that artificial sites may occasionally be used (C. Stern, pers. comm.).

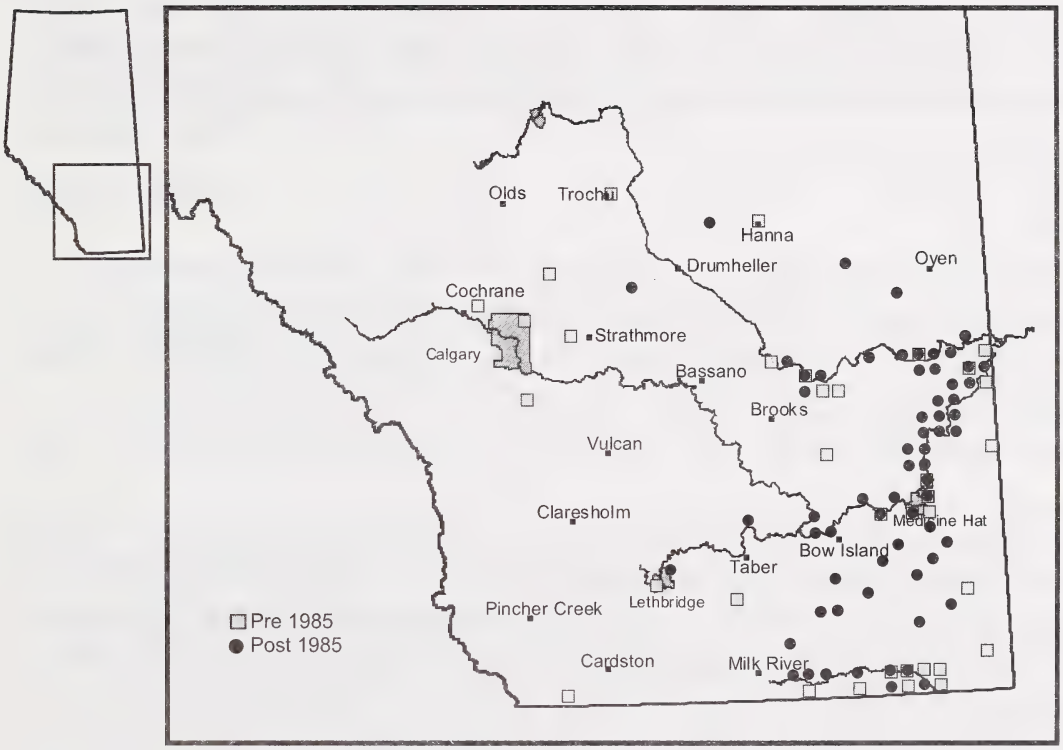


Figure 2. Historical (pre 1985) and recent (post 1985) observations of bullsnakes (*Pituophis catenifer sayi*) in Alberta.

Female bullsnakes lay eggs in nest sites that they abandon shortly after laying. Consequently, females must find sites that provide adequate incubation conditions for their eggs. Nesting sites are typically located in sandy or friable soils that allow females to excavate burrows in which to lay their eggs or to modify other animals' burrows for this purpose (J. Wright, unpubl. data, Russell and Bauer 2000). Similar to hibernation sites, nesting sites are typically on south, east, or southeast slopes that provide favourable thermal conditions for embryonic development (Didiuk 1999). In Alberta, nesting sites have been located on sandy coulee slopes and slumps along the South Saskatchewan and Red Deer Rivers (A. Didiuk, unpubl. data, J. Wright, unpubl. data).

## Reproduction

### Mating

In Alberta, bullsnakes mate in May often near hibernacula (Didiuk 1999). Males apparently locate females by following scent trails. The origin of the scent trails appears to be skin secretions rather than cloacal secretions (Smith and Iverson 1993). Males may engage in combat with other males over access to females (Shaw 1951, Russell and Bauer 2000). During copulation the male lies alongside the female and may bite her neck and back (Waye and Shewchuk 1999, Russell and Bauer 2000). Eventually, the male wraps his tail around that of the female's to align their cloacas and then inserts one of his hemipenes into the female's cloaca.

### Nesting

After mating females move to nesting sites. In Alberta, females are typically seen at nesting sites in early June (Didiuk 1999, J. Wright, unpubl. data). Females excavate their own burrows or excavate burrows of mammals, bank swallows, or other bullsnakes (Carpenter 1982, J. Wright unpubl. data). Several nesting sites in southern Alberta are located near hibernation sites (Didiuk 1999, J. Wright, unpubl. data). The locations of nesting sites are presumably chosen for their favourable thermal and moisture conditions that are necessary for development of embryos, and possibly for factors related to predator avoidance (e.g., cover).

Prior to laying their eggs, females generally shed at the nesting site or at a resting site near the laying site. Females may often use the same sites for shedding (A. Didiuk, unpubl. data). One hole near a nesting site in southern Alberta revealed several shed skins (J. Wright, unpubl. data). Females do not incubate their eggs and leave nest sites shortly after eggs are laid.

Several females may lay their eggs in the same site and a single nesting site may have several chambers with eggs from different females. As many as two dozen females have been observed at one nesting area in southern Alberta (J. Wright, unpubl. data) The behaviour of females to nest communally suggests that there is some benefit of laying their eggs together or that favourable nesting habitat is limited.

Female bullsnakes generally lay between 2 to 24 eggs (Russell and Bauer 2000). One female from the Drumheller area laid 26 eggs (J. Wright, unpubl. data). Bullsnake eggs are cylindrical in shape and approximately 20-40 mm in length (Russell and Bauer 2000). Larger females typically produce larger clutches of eggs than smaller females because they generally have more energy to invest into reproduction. Female bullsnakes typically breed annually, but some individual

females in Alberta are known to skip reproduction in some years presumably because energy stores are small (J. Wright, unpubl. data).

Because snakes are ectotherms ('cold-blooded') the rate of development of embryos is temperature dependent. Consequently, rate of development will depend on the thermal conditions of the nest. Although temperature dependent sex determination has been observed in some reptiles (e.g., turtles), there is little evidence for temperature dependent sex determination in snakes (Bull 1980, Weatherhead et al. 1998). Generally, the sex ratio of snakes at birth is approximately equal.

**Timing of Hatching**

In Alberta, neonatal snakes hatch from eggs in mid August to mid September, approximately 50 to 60 days after they are laid (Russell and Bauer 2000, J. Wright, unpubl. data). Neonates are 200-400 mm in length at birth and resemble adults in pattern and in colour (Storm and Leonard 1995).

**Diet**

Bullsnakes are considered diet generalists and will consume a variety of prey types including small mammals, birds, bird eggs, arthropods and other reptiles (Imler 1945, Wright and Wright 1957, Rodriquez-Robles 1998, Russell and Bauer 2000, Iverson and Akre 2001). Bullsnakes forage by actively searching for prey and kill their prey by constriction (De Queiroz 1984, Stebbins 1985). For smaller individuals the type of prey eaten depends on its size, but larger individuals will generally take prey of varying size (Waye and Shewchuk 1999).

At CFB Suffield, Didiuk (1999) found that two radio-marked individuals migrated to northern pocket gopher burrow complexes in June and remained at these sites until they returned to their hibernacula in late September and early October. These observations suggest that snakes migrate to areas of high prey abundance and remain there until the onset of hibernation. Similar observations have been made for prairie rattlesnakes (Duvall et al. 1985). At Suffield National Wildlife Area, bullsnakes were reported to commonly travel up to 12 km from hibernacula along the South Sasktachewan River after emergence from hibernation (A. Didiuk, unpubl.data).

**Hibernation**

Emergence from and entry into hibernation is somewhat dependent on weather conditions in the spring and in late summer and early autumn. Observations of bullsnakes at hibernation sites in Alberta suggest that bullsnakes emerge from hibernation between late April to mid June and enter hibernation in late August to mid October (Didiuk 1999, J. Wright, unpubl. data). A recent observation of an individual on 17 October 2002 on a road southwest of Medicine Hat suggests that some individuals may not return to hibernacula until late October (L. Lupyczuk, unpubl. data). At Suffield National Wildlife Area, many bullsnakes return to their hibernacula in the first week of October (A. Didiuk, unpubl. data).

The timing of emergence from hibernation appears to be sex biased with males emerging earlier than females. In Alberta, Didiuk (1999) reported that male bullsnakes were seen more often basking at hibernation entrances in late April and were more often captured in traps in the first week of May. Females were commonly captured in traps after the first week of May. Sex biases in entrance into hibernation were not as evident in Didiuk's study. However, male gopher snakes generally enter hibernation earlier than females in British Columbia (Waye and Shewchuk 1999).

In Alberta, bullsnakes commonly den with other snake species including, prairie rattlesnakes, wandering garter snakes (*Thamnophis elegans*), plains garter snakes (*T. radix*), red-sided garter snakes (*T. sirtalis parietalis*), and rarely western hognose snakes (*Heterodon nasicus*) (Cottonwood Consultant 1986, 1987, Hofman 1991, Didiuk 1999, Moes 2001). In areas where other snake species are not common, bullsnakes will den in conspecific groups (C. Stern, unpubl. data, J. Wright, unpubl. data). It is unclear whether neonatal and juvenile bullsnakes regularly den with adults. Neonatal and juvenile snakes may den at nesting sites or at other locations near hibernacula (Waye and Shewchuk 1999, J. Wright, pers. comm.). At Suffield National Wildlife Area, neonate bullsnakes were rarely encountered at hibernacula in the spring and fall (A. Didiuk, unpubl. data).

**Behaviour**

When confronted, bullsnakes will flatten and triangulate their heads and will vibrate the tip of their tails. When the tail is vibrated in dry vegetation, it produces a sound similar to a rattlesnake's rattle. This similarity in appearance and behaviour to rattlesnakes likely has increased the possibility that bullsnakes will be killed by humans. In addition to this display, bullsnakes often hiss loudly due to the presence of an epiglottal keel unique to *Pituophis* (Young et al. 1995). Bullsnakes may also strike if alarmed. Although bullsnakes lack venom, their bite can be painful.

**Limiting Factors and Threats**

In Alberta, natural threats to bullsnakes include predation by a variety of animals including, hawks, badgers, foxes, coyotes, and skunks. Nests of bullsnakes may be particularly vulnerable because females do not remain with eggs to protect them during development. Because a number of females may lay eggs in the same nest, the discovery of a nest by a predator can have a major impact on recruitment in bullsnake populations.

Several anthropogenic factors threaten the viability of bullsnake populations in southern Alberta. The general dislike of snakes by much of the public has resulted in their persecution. The superficial resemblance of bullsnakes to rattlesnakes in pattern and colour and their behaviour to 'mimic' rattlesnakes when confronted by a potential predator has likely increased the number of bullsnakes killed by humans. As a 'non-license' species, bullsnakes are not afforded any protection and thus can be hunted or harvested without restriction. Despite persecution by some individuals, many landowners and leaseholders 'protect' snakes on their land, because they

believe them to be highly effective at managing rodent populations (Froom 1972, Macartney and Weichel 1984, Diller and Johnson 1988). Some landowners in Alberta have even been known to relocate snakes to areas of high ground squirrel and pocket gopher activity as a means of pest control (J. Nicholson, pers. observ.).

Alteration of prairie habitat is likely the biggest threat to bullsnake populations in Alberta. Oil and gas and agricultural activities are increasing in Alberta, leading to the alteration and elimination of available habitat for bullsnakes. Almost 60% of original native grass prairie in Alberta has been transformed by various land use activities (Prairie Conservation Forum, 2002). This species appears to be negatively affected by changes in habitat. Habitat loss and alteration have been identified as the main factors responsible for the decline of *Pituophis catenifer* in British Columbia (Waye and Shewchuk 1999).

Increased agricultural and oil and gas activity in Alberta has also led to an increase in the number of vehicles on roads that intersect habitat used by snakes and has resulted in high incidences of road mortality. A number of known hibernation sites in Alberta occur within meters of roads, making snakes using these sites particularly vulnerable to road mortality. High levels of oil and gas extraction and agricultural activities in the spring and fall coincide with spring and fall migrations of snakes to and from hibernacula resulting in high seasonal levels of mortality on roads. In 2001, Alberta Fish and Wildlife implemented a monitoring program to investigate the number of snakes killed on roads and to provide data on distribution of snake populations within the province. To date, 84 road-killed snakes have been reported. Of these, 13% were bullsnakes. Didiuk (1999) investigated mortality of snakes on roads within the Wildlife Area on CFB Suffield. Over a two year period, 101 of 249 snakes (41%) were found dead on roads. Of the 48 bullsnakes observed on roads during this period, 22 (48%) were dead. The apparent increased mortality of bullsnakes due to traffic associated with shallow gas well development at Suffield National Wildlife Area has required traffic management by CFB Suffield and the oil and gas industry. Mitigation measures used to minimize mortality have included movement of traffic to roads more distant from the South Saskatchewan River (A. Didiuk, pers. comm.).

## DISCUSSION

The general lack of historic data on the distribution and population size and trends of bullsnakes within Alberta makes it difficult to determine whether this species has declined. Anecdotal evidence suggests that fewer bullsnakes have been observed in recent years (Cottonwood Consultants 1986, 1987). However, baseline data is needed before evidence of a decline in bullsnake populations can be established. Increasing pressure on native habitat used by bullsnakes suggests that a decline in bullsnakes in Alberta is probable, particularly combined with recent evidence from populations of *Pituophis catenifer* in British Columbia that indicates that this species is sensitive to habitat loss. There is also evidence that the prairie rattlesnake, a species with similar habitat requirements, has declined in Alberta (Watson and Russell 1997). Much of the recent information that is available on bullsnakes in Alberta has been collected incidentally by researchers studying rattlesnakes (A. Didiuk, unpubl. data, A. Fast, unpubl. data) or by individuals interested in this species (J. Wright, unpubl. data). Ongoing studies of rattlesnakes in the province (Ernst 2002, A. Didiuk, unpubl. data, A. Fast, unpubl. data) should

continue to provide some data on bullsnakes. Despite these efforts, more intensive study (e.g., mark recapture study) is needed to adequately determine population parameters (e.g., population size) for this species.

Although bullsnakes receive no formal protection under provincial or federal legislation, a number of observations of bullsnakes have been recorded within provincial parks and ecological reserves. Bullsnakes have been recorded within Writing-on-Stone Provincial Park, Dinosaur Provincial Park, and the Kennedy Coulee Ecological Reserve (Cottonwood Consultants 1987). Within these areas, bullsnakes are protected from persecution. In addition, a number of bullsnakes have been observed within the proposed boundaries of CFB Suffield, of which a large section (ca. 450 $km^2$) is maintained as a National Wildlife Area (Didiuk 1999, A. Didiuk, unpubl. data). This area may be particularly important for bullsnakes because a large section (ca. 55 km) of river valley (i.e., suitable denning and nesting habitat) occurs within this area. Bullsnake hibernacula also receive additional indirect protection due to co-hibernation of bullsnakes with rattlesnakes. While bullsnake hibernacula are protected only from 1 September to 30 April, rattlesnake hibernacula receive year-round protection.

Should bullsnakes ever be designated 'at risk' within Alberta, recovery efforts will be hampered by the biology of this species. Bullsnake females in Alberta may only reproduce every second year, resulting in low yearly recruitment (Waye and Shewchuk 1999, J. Wright, unpubl. data,). In addition, low survival of neonatal snakes is typical of snake populations, further reducing the number of snakes that are recruited into populations (Parker and Plummer 1987). Furthermore, bullsnakes may only mature in their second or third year, which will result in bullsnake populations taking longer to recover (Waye and Shewchuk 1999). Continuing high levels of road mortality (particularly if these include reproductive females) will also slow recovery of bullsnake populations. Consequently, determining strategies to maintain or increase populations of this species within Alberta is preferable to implementing recovery strategies after a decline.

**Recommendations for Future Management**

The following recommendations are suggested to help sustain populations of bullsnakes at a provincial and national level.

*Additional protection under the Wildlife Act.* Additional protection of this species should be considered due to the perceived decline of this species and due to high levels of road mortality. Under its current classification as a non-license species, bullsnakes can be harvested or hunted without permit. Reclassification of this species to a non-game species would make it illegal to kill, possess, buy or sell bullsnakes. In addition, year-round protection of bullsnake hibernacula, rather than protection only from 1 September to 30 April, would remove the threat of destruction of these sites when snakes are not in hibernation.

*Collection of baseline data on population parameters of bullsnakes*. Baseline data on parameters (e.g. size) of bullsnake populations is required to establish whether populations are in decline. Baseline data on population parameters will also be needed to inform future status assessments of this species, particularly at the national level. COSEWIC has designated this species as 'data deficient' due to a lack of information on bullsnake populations in Canada.

*Investigation of habitat use and requirements of bullsnakes.* Little information is available on the specific habitat requirements of this species across its range. Sampling techniques (e.g., trapping) in different habitats can be used to show the presence or absence of a species in specific habitats. However, these techniques provide little information about the time individuals spend in specific habitats, nor do they provide information on what activities are carried out in these habitats. Didiuk (1999) used trapping methods to investigate what habitats snakes (including bullsnakes) occurred in, but only in habitats over a small portion of these species' range in Alberta. Radio-telemetry can also be used to investigate habitat use of snakes. This method allows individual snakes to be followed throughout the active season. Consequently, this method provides data on time budgets in certain habitats and what activities are carried out in these habitats, in addition to which habitats are used by snakes. Radio-telemetry can also be useful for locating additional snake hibernacula and nesting sites of snakes.

*Investigation of effects of road mortality on snakes.* The available evidence for snakes suggests that road mortality is a significant factor influencing snake populations. Road mortality, particularly of reproductive females, could severely impact snake populations. Evidence from Alberta suggests that many snakes are killed on roads each year. Systematic studies to investigate the timing, location, and number of mortalities may be used to inform mitigation strategies (e.g., 'snake crossing' signs) to decrease the number of snakes killed on roads.

*Education efforts to inform the public.* Snakes tend to be a highly misunderstood group of animals. Snakes are typically secretive and cryptic, and thus not easily observed in the wild. Consequently, a general feeling of dislike and fear has been associated with snakes. Furthermore, the presence of venomous species of snakes in a particular area typically increases animosity toward all snakes in that area. Efforts to inform the public about the biology and natural history of snakes can increase public appreciation for snakes. In addition, demonstrations of how to identify the various species of snakes in an area and how to deal with or avoid snake encounters should also alleviate some of the public's concern. Where the range of rattlesnakes and bullsnakes overlap, a demonstration of how to distinguish between these superficially similar species should decrease the number of mortalities of bullsnakes that occur from misidentification and fear for personal safety. Finally, a discussion of the benefits of snakes should also increase public appreciation for snakes. Bullsnakes and other snakes that prey upon small mammals can be economically important because they can remove a significant proportion of these crop pests in an area (Froom 1972, Diller and Johnson 1988, Waye and Shewchuk 1999).

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**Appendix 1.** A copy of the letter sent to individuals and organizations requesting observations of bullsnakes (*Pituophis catenifer sayi*) in Alberta.

Hello,

The Bullsnake (*Pituophis catenifer sayi*) (formerly *Pituophis melanoleucus sayi*) has been identified as a 'sensitive' species in Alberta due to concerns that it may be in danger of decline. Additionally, COSEWIC has assigned a designation of 'data deficient' to this species, due to a lack of information on this species' population size and trends within Canada. In an effort to learn more about this species, we are writing a report that summarises the available literature and information on this species in Alberta. This report will be valuable to biologists and resource professionals for managing populations and habitat for this species and should aid in future status assessments for this species.

Part of our initiative is to create a database of observations of Bullsnakes within Alberta. This data will be useful in determining the range of the Bullsnake in Alberta and whether its range has contracted in recent years. If you have data on Bullsnakes from Alberta that you are willing to share, it would be extremely valuable to this report. All information provided to us will be accredited to you or your affiliation. In addition, information on locations that is deemed sensitive (e.g., observations of Bullsnakes at hibernation sites) will be designated as "sensitive information" in the report and the exact location will not be provided. We would also like to enter this data in the Alberta Biodiversity/Species Observation Database. This database is restricted to Alberta government employees and is referenced mainly for land use decisions involving agricultural and industrial activities. For any data you provide, please indicate whether we have your permission to enter it in our provincial database.

The specific information that we would like to acquire for each Bullsnake record from Alberta is:

Date
Time
Location (latitude/longitude or UTM preferably, or general description or land location)
Map datum (e.g., NAD 83) - if known
Name of observer
Count of bullsnakes observed
Dead or alive
Age/sex of individuals
Size
Sensitivity of the data (sensitive or not sensitive - i.e., observed at den or incidental observation)

**Note: Records for which only some of this information is available are also useful to us and should be included.

Data can be sent by email to Kelley.Kissner@gov.ab.ca or Joel.Nicholson@gov.ab.ca or by mail to:

Kelley Kissner or Joel Nicholson
Alberta Sustainable Resource Development
Fish and Wildlife Division
Room 301, Provincial Building
346 3rd Street SE
Medicine Hat, Alberta
T1A 0G7

Once completed, this report will be available online at http://www3.gov.ab.ca/env/info/infocentre/publist.cfm

If you would like a hardcopy of the report when it is completed, please provide your mailing address to us.

Please feel free to forward this message to other individuals who may have information on Bullsnakes in Alberta and who were not included on our list. If you have any questions please feel free to contact us by email (addresses above) or by phone at 403-528-5209 (Kelley) or 403-528-5202 (Joel).

Thank you for your help.

Sincerely,

Kelley Kissner, Wildlife Biologist
Joel Nicholson, Non-game Biologist

Alberta Sustainable Resource Development
Fish and Wildlife Division
Southeast Region
Medicine Hat, Alberta

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